Attorney Docket No. P12470/8194-453IP PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Erik Bengtsson et al.
Serial No.: 09/746,823
Filed: December 22, 2000
For: IQ MODULATION SYSTEMS AND METHODS THAT USE SEPARATE PHASE AND AMPLITUDE SIGNAL PATHS AND PERFORM MODULATION WITHIN A PHASE LOCKED LOOP

Confirmation No.: 8910
Group Art Unit: 2631
Examiner: Khanh C. Tran

DECLARATION OF SCOTT JUSTICE PURSUANT TO 37 C.F.R. § 1.131

Sir:

I, Scott Justice, hereby declare and say that:

1. I am one of the named inventors of the subject matter of the above-referenced patent application.

2. Prior to October 25, 2000, the inventors of the above-referenced patent application had conceived of the subject matter of Claims 10, 12-19, 28 and 30-36.

3. In support of the above statement of Section 2, I hereby submit as **Appendix A** a copy of an Invention Disclosure which is dated prior to October 25, 2000. This document establishes that the subject matter of the above-referenced claims was conceived on or before October 25, 2000. The dates in the document have been redacted, but I hereby confirm that the document was created and witnessed prior to October 25, 2000.

4. Due diligence was exercised from prior to October 25, 2000, to the December 22, 2000 filing of the present patent application.

5. In support of the above statement of Section 4, a copy of the first page of a letter from Myers Bigel Sibley & Sajovec dated November 29, 2000 is attached at **Appendix B** which forwarded an initial draft of a patent application for the inventors to review. The Application was filed less than a month later, on December 22, 2000.

6. In summary, my statements herein and the documents I have concurrently submitted show conception of the invention prior to October 25, 2000, coupled with due

diligence from prior to October 25, 2000, to the filing of the application less than two months later on December 22, 2000.

7. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true. I further declare that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Scott Justice — 9/16/2005
Date

Prepared	Date	Rev	
RT/EUS/VR/XA Scott Justice (919) 472-7271		A	
Approved / Checked		File	DMAP Alternates

Direct Modulation of Amplitude and Phase Alternates

Inventors:

Erik Bengtsson

Aristotele Hadjichristos

Scott Justice

1 What problem is solved by your invention? Describe generally the nature of your invention and what area of technology it addresses.

The invention discloses transmitter system architectures that relate to direct modulation architectures. This disclosure shows some alternate architectures that could be used to perform direct modulation in the transmitter. In the Direct Modulation of Amplitude and Phase (DMAP) architecture, the IQ modulation takes place at the IF frequency by directly modulating the IF reference signal. The modulation could also be applied to the system architecture by modulating the LO signal and leaving the IF as an unmodulated signal. Alternately, the modulation could be applied anywhere in the feedback path of the PLL. The RF could be modulated, and then mixed with a unmodulated LO and IF frequencies. Alternately, the modulation could be performed after the mixer in the feedback path of the PLL if it is desired to keep the IQ modulator running at the IF frequency.

2 How was this problem solved before (inside or outside Ericsson)? Cite any known inventions for which yours is a replacement.

2.1 Ericsson Prior Art (A) DMAP solution for transmitter

The DMAP solution is the current solution for our transmitter architecture. It is described in the combination patent that was formed using the following two invention disclosures:

1) High Signal-to-Noise Ratio Radio Transmitter for Wireless Voice and Data Applications
2) I/Q and Amplitude Waveform Generation for Rho-Theta Transmitter

Inventor's Full Signature	Date	Witnessed, read, understood and signed by	Date
(1)		(1)	
(2)		(2)	
(3)		(3)	

3 What were the shortcomings of those earlier solutions? Explain why the known inventions are insufficient. What was the motivation for your invention?

3.1 Prior Art (A) Transmitter architecture

The DMAP architecture works very well and seems to be the best solution given our knowledge of transmitters at this time. There are other similar ways to perform direct modulation of amplitude and phase without infringing on the patent mentioned in section 2.1 of this disclosure. One of these ideas may prove to be the solution of choice in the future, and we would like to protect Ericsson's interests.

3.3 Motivation for the Invention

The motivation for the invention is to protect all transmitter architectures similar to the DMAP architecture.

4 What is your invention and how is it better than those prior solutions? Describe in detail the structure and operation of your invention, including the features which make it advantageous over known inventions. Be specific in your description of how to make and use your invention. Attach drawings, flow charts, block diagrams, schematics, etc.

4.1 General Description

In the idea disclosed here, we show that it is possible to IQ modulate the DMAP system architecture in many other places in the circuit. Figure 1 shows the DMAP architecture and the DMAP patent described in section 2.1. If the modulation is performed at position I&Q 1, this figure corresponds to the phase portion of the prior art DMAP architecture. It is also possible to IQ modulate the signal at position I&Q 2, this would correspond to IQ modulating at the IF frequency, but the modulation would take place in the feedback portion of the PLL instead of at the IF input.

The third choice for IQ modulation would be to modulate the LO frequency before it is mixed with the RF to create the IF feedback signal. The phase will be preserved through the mixer and

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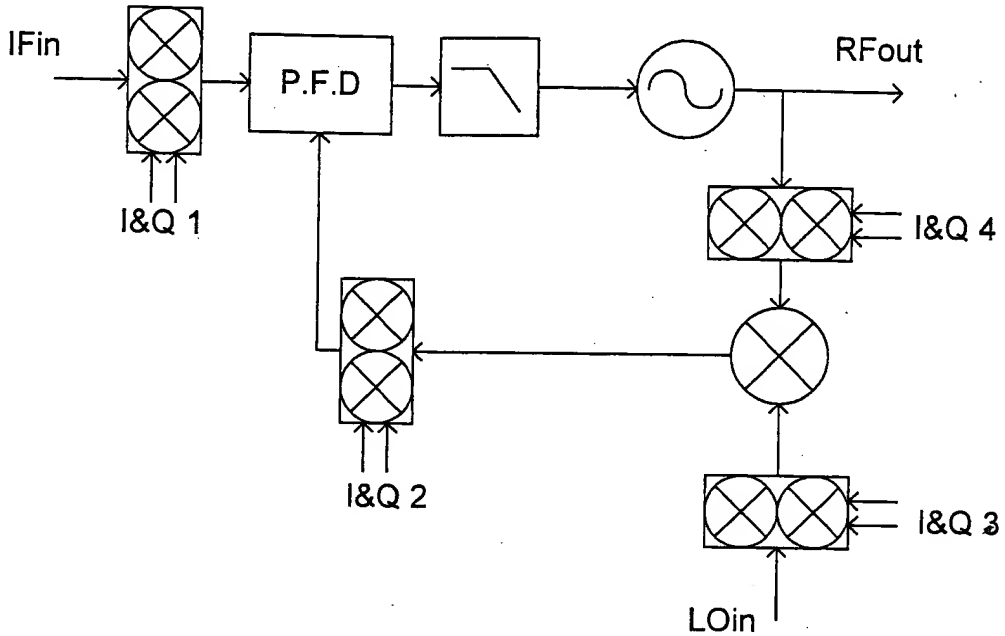
it will be as if nothing changed from modulating at the IF at position I&Q 1. We have a testboard working in the lab with implementations applying I&Q at positions 1 and 3.



Finally, it would also be possible to IQ modulate the RF signal at position I&Q 4. All four implementations give basically the same result at the output. We have not built implementations 2 and 4 in the lab, but the theory is the same as for implementations 1 and 3.

In TDMA3, we anticipate using either implementation 1 or 2 since it is more efficient to IQ modulate at the IF frequency. Modulating at RF or LO would typically require more current than modulating at IF. The current will depend on the frequency plan of the system. We would like to keep others from simply using the DMAP approach by moving the point where the modulation is applied. It can be applied anywhere in the feedback path of the PLL or at the Ifin and it still works.

This disclosure has addressed the phase modulation portion of the DMAP architectures. The amplitude needs to be applied somewhere also. It can be applied anywhere in the system after the VCO. It can either be applied inside the PLL or to the output of the PLL. A typical implementation would apply the amplitude signal to a VGA or PA that were either within the PLL, or that followed the PLL. Different amplitude modulation schemes are described more fully in the patent disclosures described in section 2.1.

Inventor's Full Signature	Date	Witnessed, read, understood and signed by	Date
(1)		(1)	
(2)		(2)	
(3)		(3)	

(B)

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November 29, 2000

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Aristotle Hadjichristos
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P.O. Box 13969
Research Triangle Park, NC 27709

Re: Patent Application entitled *IQ Modulation Systems and Methods that Use Separate Phase and Amplitude Signal Paths and Perform Modulation Within a Phase Locked Loop*
Ericsson Dkt. P12470-US2-BMOT Our File 8194-453IP

Dear Inventors:

Enclosed is an initial draft of the patent application directed to the above invention.

As we discussed, the present application is being filed as a continuation-in-part (CIP) of your original application entitled *IQ Modulation Systems and Methods That Use Separate Phase and Amplitude Signal Paths*, filed October 31, 2000 (Ericsson File No. P12470-US1-BMOT; Our File 8194-453). As such, Figures 1-13 and the accompanying description are carried over from the original application. Figures 14-22 and the accompanying description thereof, and Claims 1-36, are all new. The Summary and Abstract also have been revised to include the new subject matter.

It is essential that the patent application, as filed, be technically accurate and complete, and that it set forth the best mode of carrying out your invention, since new matter may not be added to the descriptive portion after filing. We therefore ask that you carefully review the draft for technical accuracy and completeness and advise us of any suggested changes or corrections. Your changes and suggestions will be carefully considered in the preparation of a final draft, which will be presented to you for your review and execution prior to filing.

We would also like to point out that an inventor is required to make a Declaration when his application is filed in the U.S. Patent and Trademark Office, acknowledging a duty to disclose information of which he is aware and which may be considered to be material to the